

## Complete Summary

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### GUIDELINE TITLE

Evidence based clinical practice guideline for medical management of first time acute urinary tract infection in children 12 years of age or less.

### BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of first time acute urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Apr 18. 20 p. [61 references]

### GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence-based clinical practice guideline for patients 6 years of age or less with a first time acute urinary tract infection (UTI). Cincinnati (OH): Children's Hospital Medical Center (CHMC); 1999 Mar 28. 14 p.

## COMPLETE SUMMARY CONTENT

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## SCOPE

### DISEASE/CONDITION(S)

Acute urinary tract infection (UTI)

### GUIDELINE CATEGORY

Diagnosis  
Evaluation  
Management  
Treatment

#### CLINICAL SPECIALTY

Family Practice  
Infectious Diseases  
Nephrology  
Pediatrics  
Radiology  
Urology

#### INTENDED USERS

Advanced Practice Nurses  
Allied Health Personnel  
Health Care Providers  
Nurses  
Patients  
Physician Assistants  
Physicians

#### GUIDELINE OBJECTIVE(S)

- In children 12 years of age or less, with a first time presumed or definite episode of urinary tract infection (UTI), the objectives of this guideline are:
  - To improve the use of appropriate diagnostic criteria
  - To improve the use of appropriate antibiotic therapy
  - To improve the use of appropriate imaging studies
  - To avoid long-term medical problems
  - To improve parental involvement in decision-making around the management of urinary tract infections
  - To identify the infants and children at most risk for long-term renal damage

#### TARGET POPULATION

Children 12 years of age or less, with a first time presumed or definite episode of urinary tract infection (UTI)

These guidelines are not intended for use in children:

- With known immunodeficiencies
- With known major genitourinary anomalies
- With sepsis with shock or meningitis
- Needing ventilator or other intensive care
- With other severe comorbid conditions

#### INTERVENTIONS AND PRACTICES CONSIDERED

## Diagnosis/Evaluation

1. History and physical examination
2. Screening for urinary tract infection (UTI)
  - Dipstick (nitrite and leukocyte esterase [LE])
  - Routine urinalysis (nitrite, leukocyte esterase, and microscopy)
3. Urine culture and susceptibilities

## Management/Treatment

1. Parenteral antibiotics (inpatient)
  - Cefotaxime (Claforan®)
  - Ampicillin
  - Gentamicin
  - Ceftriaxone (Rocephin®)
2. Antibiotics for outpatient treatment
  - First line
    - Cefixime (Suprax®)
    - Cephalexin (Biocef®, Keflex®)
    - Sulfamethoxazole/trimethoprim (Bactrim®, Septra®, Generic)
  - Alternative antibiotics
    - Nitrofurantoin (Macrochantin®, Furadantin®)
    - Ciprofloxacin (Cipro®)
    - Ceftriaxone (Rocephin®)
3. Evaluate for structural abnormalities for the urinary tract or bladder using imaging procedures
  - Renal and bladder ultrasound (US)
  - Radionuclide cystogram (RNC)
  - X-ray voiding cystourethrogram (VCUG)
  - Renal cortical scan
4. Appropriate consultation and referral when necessary
5. Follow-up
  - Acute illness resolution
  - Monitor for recurrence
  - Prophylactic antibiotics
    - Sulfamethoxazole/trimethoprim (Bactrim®, Septra®, Generic)
    - Nitrofurantoin (Macrochantin®, Furadantin®)
    - Amoxicillin
    - Cephalexin (Biocef®, Keflex®)

## MAJOR OUTCOMES CONSIDERED

- Sensitivity and specificity of laboratory testing (urinalysis)
- Anatomic abnormalities identified
- Recurrence

## METHODOLOGY

## METHODS USED TO COLLECT/SELECT EVIDENCE

## Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

To select evidence for critical appraisal by the group, the Medline, EmBase, and the Cochrane databases were searched for dates of January 1999 through October 2004 to generate an unrefined, "combined evidence" database using a search strategy focused on answering clinical questions relevant to urinary tract infection (UTI) and employing a combination of Boolean searching on human-indexed thesaurus terms (Medical Subject Heading [MeSH] headings using an OVID Medline interface) and "natural language" searching on words in the title, abstract, and indexing terms. The citations were reduced by eliminating duplicates, review articles, non-English articles, and adult articles. The resulting abstracts were reviewed by a methodologist to eliminate low-quality and irrelevant citations. During the course of the guideline development, additional clinical questions were generated and subjected to the search process.

### NUMBER OF SOURCE DOCUMENTS

669

### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

### METHODS USED TO ANALYZE THE EVIDENCE

Review  
Review of Published Meta-Analyses

### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

### DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The recommendations contained in this document were formulated by an interdisciplinary working group which performed systematic and critical literature reviews, using the grading scale described below under "Type of Evidence Supporting the Recommendations," and examined current local practices.

During formulation of these guidelines, the team members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

#### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

#### METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups  
External Peer Review  
Internal Peer Review

#### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guidelines have been reviewed and approved by clinical experts not involved in the development process, senior management, Risk Management & Corporate Compliance, other appropriate hospital committees, and other individuals as appropriate to their intended purposes.

### RECOMMENDATIONS

#### MAJOR RECOMMENDATIONS

Each recommendation is followed by an evidence classification (A-X) identifying the type of supporting evidence. Definitions for the types of evidence are presented at the end of the "Major Recommendations" field.

##### Assessment and Diagnosis

##### History and Physical Examination

1. It is recommended that prompt evaluation for a diagnosis of urinary tract infection (UTI) be conducted. See the table below for clinical findings consistent with the diagnosis of a UTI.

Table: Clinical Signs and Symptoms of UTI

Newborns	Infants and Preschoolers	School Age Children
Jaundice		

Newborns	Infants and Preschoolers	School Age Children
Sepsis	Diarrhea	
Failure to thrive	Failure to thrive	
Vomiting	Vomiting	Vomiting
Fever	Fever	Fever
	Strong-smelling urine	Strong-smelling urine
	Abdominal or flank pain	Abdominal or flank pain
	New onset urinary incontinence	New onset urinary incontinence
	Dysuria (preschoolers)	Dysuria
	Urgency (preschoolers)	Urgency
		Frequency

Adapted from Todd, 1995 [S]

Note: Risk factors for UTI include:

- Male:
  - Uncircumcised <1 year
  - All <6 months
- Female, in general
  - Particularly <1 year
- Non-African-American race
- Fever  $\geq 39$  degrees Celsius

(Shaw et al., 1998 [C]; Craig et al., 1996 [C]; Hoberman et al., 1993 [C]; Bachur & Harper, "Reliability," 2001 [D]; Bachur & Harper, "Predictive model," 2001 [D])

Absence of high fever or other specific risk factors does not preclude the presence of UTI. Please refer to Appendices 2 and 3 of the original guideline document for further information on positive culture prevalence in patients with UTI symptoms and UTI prevalence and risk factors in children with fever.

## Laboratory Studies

2. It is recommended that urine samples be collected by catheter or suprapubic aspiration (if age appropriate), if a high quality clean catch mid-stream urine sample cannot be obtained (Hoberman et al., 1996 [C]; Weinberg & Gan, 1991 [D]).

Note 1: See Cincinnati Children's Hospital Medical Center (CCHMC) Nursing Policies, Procedures and Standards: "III-701 Urinary Catheterization/Bladder Irrigation" in the "Availability of Companion Documents" field.

Note 2: In a child with a low clinical suspicion of UTI, and in whom a catheterization would be both required for a culture and considered invasive by the clinician or the family, the option to perform a dipstick or routine

urinalysis on a specimen collected by more convenient means may be considered, followed by catheterization if the urinalysis suggests a UTI (American Academy of Pediatrics [AAP], 1999 [S]). See the table below for likelihood ratios (LR) that a screening test for UTI will result in a positive urine culture.

Table: Likelihood Ratios (LR) that a Screening Test for UTI will Result in a Positive Urine Culture

Positive Test Result -- to Rule in UTI	Positive LR*
Nitrite	25
Microscopy, bacteria	5
Microscopy, leukocytes	4
Leukocyte esterase (LE)	5 (approx. range 2-18)
Gram stain	19

(Gorelick & Shaw, 1999 [M]; Armengol, Hendley, & Schlanger, 2001 [C])

\*LR scale: rules of thumb:

- LR >10 greatly increases diagnostic certainty
- LR = 1 test result is not helpful in diagnosis
- LR <0.2 greatly helps rule out condition

Likelihood ratios quantify the change in probability of definite UTI when a given test result is present in a specific clinical case and depend upon a starting estimate of probability. For more information, see Appendix 6 of the original guideline document for definition and use of LR.

3. It is recommended, in screening for UTI, to perform:
  - dipstick (nitrite and LE) or
  - routine urinalysis (nitrite, LE and microscopy)

and

- urine culture and susceptibilities

(Gorelick & Shaw, 1999 [M]). See table above for LRs that a screening test for UTI will result in a positive urine culture.

Note: Gram stain is not commonly conducted in the Cincinnati pediatric community (Hoberman et al., 1996 [C]).

## Diagnosis

### General

Presumed UTI is diagnosed while urine culture results are pending in a child with abnormal laboratory studies and clinical findings consistent with the diagnosis of a UTI.

Definite UTI is diagnosed after obtaining a positive result for a urine culture in a child presenting with a clinical profile consistent with a UTI.

#### Presumed UTI

4. It is recommended that while pending results of culture, any positive result from a dipstick or routine urinalysis, in the presence of clinical findings consistent with the diagnosis of a UTI, be considered consistent with a presumptive diagnosis of UTI (Gorelick & Shaw, 1999 [M]).

Any of the following study results defines a positive urinalysis (Gorelick & Shaw, 1999 [M]). See table above titled "LR that a Screening Test for UTI Will Result in a Positive Urine Culture" and table below.

- Positive nitrite screen
- Positive LE
- Positive microscopic exam
  - The definition of abnormal microscopic exam is dependent on patient or provider-specific determinants.

Table: Microscopic Exam

WBC/hpf* (spun)	LR
$\geq 5$	3.7-13.5
$\geq 10$	6.2-32.0

\*WBC/hpf: White blood cells/high-powered field

(Hoberman et al., 1993 [C]; Weinberg & Gan, 1991 [D])

#### Definite UTI

5. It is recommended that a definite UTI be defined as a single organism cultured from a suprapubic aspirate (SPA), catheter specimen (cath), or clean catch midstream specimen (CCM) at the following concentrations. The higher the concentration of organisms, the more reliable the results; however, colony counts must be interpreted within the clinical context and lower colony counts may be significant, especially in a dilute urine
  - Suprapubic aspirate:  $\geq 1,000$  colony forming units (cfu)/mL
  - Catheter specimen:  $\geq 10,000$  cfu/mL
  - Clean catch midstream specimen:  $\geq 100,000$  cfu/mL

(Hansson et al., 1998 [C]; Rushton, 1997 [S, E])

#### Management



## Admission Criteria

1. It is recommended that admission be primarily restricted to infants and children:
  - Who require intravenous (IV) for fluids
  - Who require intravenous antibiotics due to severe illness or due to lack of response to oral (PO) antibiotics
  - Who are 0-30 days of age
  - Who are 31-60 days of age and identified as high-risk clinically or by laboratory data, or
  - With whom the clinician or family is uncomfortable managing in an outpatient setting

(Local Expert Consensus, [E])

Note: A high quality, randomized controlled trial demonstrated that oral cefixime is a safe and effective treatment for children age 1-24 months with definite UTI. (Hoberman et al., 1999 [A])

## Medications

2. It is recommended that a child with presumed UTI be empirically treated with antibiotics after obtaining an appropriate sample for culture. Prompt treatment with antibiotics reduces the severity of renal scarring (Benador et al., 1997 [C]; Winberg et al., 1982 [S, E]). See Appendix 7 and Appendix 8 of the original guideline document for summary of recommended doses for parenteral and oral antibiotics, respectively.

Note: Well-appearing children who are not febrile, and in whom dipstick or urinalysis results are equivocal can be considered for outpatient observation without starting antibiotic therapy until the subsequent clinical course and culture results are known. As long as uncertainty persists, this course of management assumes:

- Available reliable follow-up as needed and
- Healthcare provider(s) confident that caregiver will use appropriate observational and follow-up skills

(Local Expert Consensus, [E])

3. It is recommended, if the child is diagnosed with a definite UTI, that antibiotic therapy be continued for a minimum of 7-14 days (Keren & Chan, 2002 [M]). Culture and susceptibility results may indicate that a change of antibiotic is necessary. See Appendix 7 and Appendix 8 for summary of recommended doses for parenteral and oral antibiotics, respectively.
4. It is recommended, if the urine culture is negative, that antibiotics be discontinued (Local Expert Consensus [E]).

## Discharge Criteria

5. It is recommended that the hospitalized child be discharged as soon as:

- Afebrile for at least 12 hours
- Taking adequate oral fluids
- Pain controlled with oral medications
- Home antibiotics tolerated (peripherally inserted central catheter [PICC] line or oral)
- Parent confident in caring for child at home
- Imaging studies are complete or arrangements have been made
- Primary care provider(s) identified, notified, and agree(s) with discharge decision, and arrangements for appropriate follow-up have been made

(Local Expert Consensus, [E])

## Imaging

Imaging procedures available for children with UTI are described in the table below titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Time Definite UTI": ultrasound (US), cystogram and renal cortical scan. See also imaging algorithm, page 8 of the original guideline document and Appendix 11 (reflux grading system) of the original guideline document.

Table. Three Major Categories for Radiologic Evaluation of a Child Following a First Time Definite UTI

Category	Procedure	Purpose	Notes
I. ULTRASOUND	Renal and bladder ultrasound (US)	Demonstration of the anatomy of the kidneys, ureters, and bladder	<ul style="list-style-type: none"> <li>• Not reliable to evaluate reflux</li> <li>• Limited accuracy in evaluation of renal scarring or pyelonephritis</li> </ul>
II. CYSTOGRAM	Radionuclide Cystogram (RNC)  Also called nuclear cystogram	Screening and grading vesicoureteral reflux (VUR)	<ul style="list-style-type: none"> <li>• Suggested for girls only, if available</li> <li>• Reproducibly low radiation dose</li> <li>• The grading is similar to VCUG when performed by experienced radiologist</li> <li>• Little anatomic detail</li> </ul>
	X-ray voiding cystourethrogram (VCUG)  Also called fluoroscopic VCUG	Screening and grading VUR  Demonstration of anatomic detail of the male urethra,	<ul style="list-style-type: none"> <li>• Suggested for girls and all boys</li> <li>• Involves ionizing radiation</li> </ul>

Category	Procedure	Purpose	Notes
		ureters (when reflux is present), and bladder	
III. RENAL CORTICAL SCAN	Renal Cortical Scan  Uses 99m-Technetium-Dimercaptosuccinic Acid ( <sup>99m</sup> TcDMSA) or <sup>99m</sup> Tc glucoheptonate  Also called scintigraphy or DMSA	Accurate for differentiating pyelonephritis from cystitis and assessing for renal scarring.	<ul style="list-style-type: none"> <li>Requires intravenous injection of radioisotope, with imaging about 2 hours later for about 45 minutes</li> <li>Sedation usually required in those &lt;3 years of age</li> </ul>
<p>General Comments:</p> <ul style="list-style-type: none"> <li>Both ultrasound and cystogram may be scheduled for the same visit. If the RNC is not available at the preferred location, a VCUG is acceptable.</li> <li>The diagnostic validity of VCUG for detection of VUR does not appear to be affected by performing the procedure during inpatient stay for treatment of UTI (Mahant, To, &amp; Friedman, 2001 [D]).</li> <li>When performing a cystogram on a child at risk for bacterial endocarditis due to a congenital heart defect, the American Heart Association recommends prophylactic antibiotic therapy.</li> </ul>			

A primary goal of imaging is to identify structural abnormalities of the urinary tract or bladder that may benefit from surgical or medical intervention. Decisions to perform imaging presume that the findings will sufficiently influence management to justify the burden of testing; for example, the discomfort of catheterization.

Note 1: The diagnostic validity of a cystogram for detection of VUR does not appear to be affected if the procedure is performed during an inpatient stay for treatment of UTI (Mahant, To, & Friedman, 2001 [D]).

Note 2: Routine cystogram and US following a first childhood UTI identifies a small proportion of children with associated treatable conditions. The approximate prevalences of VUR among girls age 0–18 years referred for VCUG evaluation after documented UTI (first or subsequent) are: Grade I, 7%; Grade II, 22%; Grade III, 6%; Grade IV, 1%; and Grade V, <1% (Bisset, Strife, & Dunbar, 1987 [D]). The prevalence of US-identified anatomic abnormalities amenable to surgical correction following first UTI is approximately 1% (Zamir et al., 2004 [C]; Bisset, Strife, & Dunbar, 1987 [D]).

- It is recommended, because careful long-term outcomes research has not been performed, that children in the following categories, with a first-time UTI, have a cystogram and US. See Table Above Titled "Three Major

Categories For Radiologic Evaluation of a Child Following a First Time Definite UTI."

- All boys
- Girls age <36 months (see Note 1 below)
- Girls age 3 to 7 years (84 months) with fever  $\geq 38.5$  degrees C (101.3 degrees F)

(Gordon et al., 2003 [M]; Hoberman et al., 2003 [A]; Wennerstrom et al., "Renal function," 2000 [C]; Jodal, 2000 [S]; AAP 1999 [S]).

Note 1: Although an age break at 3 years is used, the appropriate age cutoff may depend, in part, on the girl's ability to verbalize dysuria symptoms and/or her status of toilet training (Local Expert Consensus [E]).

Note 2: A relatively small number of significant anatomic abnormalities will be missed if routine imaging after first UTI is not done (Zamir et al., 2004 [C]; Bisset, Strife, & Dunbar, 1987 [D]).

Note 3: Schedule the US and cystogram for the same date, with the cystogram to follow the US. If an RNC has been ordered, and if there are significant US abnormalities, the Radiology staff physician will ask to substitute a VCUG for the RNC at that appointment.

Note 4: An optional imaging evaluation for children with febrile UTI, especially those over age 3 years, is to first perform US and renal cortical scan (see table above titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Time Definite UTI"). This avoids bladder catheterization (part of the cystogram procedure) if the results of the scan are normal. However, if pyelonephritis or cortical scarring is found on the renal cortical scan, a cystogram is indicated.

7. It is recommended, for children in the following categories, that observation without imaging be considered and that the family share in the decision of whether or not imaging be performed after the first UTI or delayed until after the second UTI, if one occurs:
  - Girls  $\geq 3$  years of age without fever (temperature  $\leq 38.5$  degrees C)
  - All girls  $\geq 7$  years of age

(Local Expert Consensus, [E]).

Observation without imaging is defined as follow-up with dipstick or routine urinalysis when age-appropriate symptoms of UTI are observed.

Note 1: For imaging after first or second UTI, one option is to perform a cystogram and US. An alternative, for febrile UTI, is to perform a renal cortical scan and US (see Note 4 in the previous recommendation, and see table above titled "Three

## Major Categories for Radiologic Evaluation of a Child Following a First Time Definite UTI").

Note 2: Factors influencing choice of imaging option:

- Clinical symptoms and rate of resolution (see table above titled "Clinical Signs and Symptoms of UTI")
  - Age (continuously decreasing risk of reflux over age 5 years)
  - Abnormal relevant history (e.g., voiding dysfunction) or physical exam (e.g., sacral dimple)
  - Family input: family understands the imaging procedures, that there is a small chance that an anatomic abnormality exists, and that close follow-up is needed for subsequent UTIs after which imaging may be performed
  - Compliance: confidence that caregiver will use appropriate observational skills and follow-up
  - African-Americans have lower risk of VUR and renal damage (West & Venugopal, 1993 [C]; Chand et al., 2003 [D]; Melhem & Harpen, 1997 [D]; Askari & Belman, 1982 [D])
  - Availability of prenatal US images for review by radiologist (Ismaili et al., 2004 [C]; Chitty et al., 1991 [D]).
8. It is recommended that a renal cortical scan be considered if identification of acute pyelonephritis or renal scarring will affect management decisions in febrile UTI (Wennerstrom et al., "Ambulatory blood pressure," 2000 [C]; Wennerstrom et al., "Renal function," 2000 [C]; Majd & Rushton, 1992 [S, E]; Rushton et al., 1988 [F]). See table above titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Time Definite UTI."

Note: The long-term significance of scarring identified by a renal cortical scan remains unclear. Factors to be considered are illness severity, grade of VUR, radiation exposure, and avoidance of bladder catheterization.

### Follow-up

9. It is not recommended that routine follow-up urine cultures be conducted during the initial course of inpatient or outpatient therapy.

Note: In a retrospective study, there were no positive results among follow-up urine cultures in 291 children while hospitalized with UTI. Thirty-two percent of these patients had fever longer than 48 hours (Currie et al., 2003 [D]).

10. It is recommended that follow-up assessment for expected clinical response occur after 48 to 72 hours of antimicrobial therapy. Culture and susceptibility results may indicate that a change of antibiotic is necessary. If expected clinical improvement is lacking, consider further evaluation which may include

laboratory studies, imaging, and/or consultation with specialists (Local Expert Consensus, [E]).

11. It is recommended that antibiotic prophylaxis be considered after completion of antibiotic therapy, depending on age and severity of illness, for children who will have imaging; the initial duration of prophylaxis to continue until radiologic evaluation results are known (Local Expert Consensus, [E]). See Appendix 10 of the original guideline document for a summary of recommended doses of prophylactic antibiotics.

Note 1: Local practice, for many years, has been to use prophylactic antibiotics in children with reflux to prevent recurrent UTIs. Evidence in the medical literature demonstrating the effectiveness of antibiotic prophylaxis in preventing recurrent UTIs is not conclusive (Williams, Lee, & Craig, 2001 [M]; Le Saux, Pham, & Moher, 2000 [M]), but clinical trials to address this question are being designed.

Note 2: The duration of prophylaxis may depend upon the age of the child and initial imaging evaluation.

Note 3: Antibiotic prophylaxis also has been used in some children who have had pyelonephritis in the absence of reflux to prevent recurrence of infection. Recurrent UTIs are correlated with renal scarring (Wennerstrom et al., "Primary and acquired," 2000 [C]; Greenfield, Ng, & Wan, 1997 [C]) which is correlated with long-term renal complications (Wennerstrom et al., "Renal function," 2000 [C]).

12. It is recommended, for on-going follow-up after the first UTI, that dipstick, urinalysis and/or culture be encouraged for a child with age-appropriate symptoms of UTI, including unexplained fever (Local Expert Consensus, [E]). See table above titled "Clinical Signs and Symptoms of a UTI." Screening urine cultures are not necessary (Wettergren et al., 1990 [C]).

### Consults and Referrals

1. It is recommended that consultation with a specialist in childhood renal disorder be considered:
  - When uncertain about the management of a child with documented or suspected VUR, renal scarring, or structural abnormalities of the urinary tract; or
  - If a renal or bladder stone is identified

(Local Expert Consensus, [E]).

2. It is recommended that a consultation with Infectious Diseases be considered when there are questions about antibiotic selection or unusual organisms (Local Expert Consensus, [E]).

### Definitions:

Evidence Based Grading Scale:

- A: Randomized controlled trial: large sample
- B: Randomized controlled trial: small sample
- C: Prospective trial or large case series
- D: Retrospective analysis
- E: Expert opinion or consensus
- F: Basic laboratory research
- S: Review article
- M: Meta-analysis
- Q: Decision analysis
- L: Legal requirement
- O: Other evidence
- X: No evidence

#### CLINICAL ALGORITHM(S)

Algorithms are provided in the original guideline document for:

- The medical management of a first time acute urinary tract infection (UTI)
- Recommended imaging for first time acute urinary tract infection

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is classified for the recommendations (see "Major Recommendations").

Evidence Based Grading Scale:

- A: Randomized controlled trial: large sample
- B: Randomized controlled trial: small sample
- C: Prospective trial or large case series
- D: Retrospective analysis
- E: Expert opinion or consensus
- F: Basic laboratory research
- S: Review article
- M: Meta-analysis
- Q: Decision analysis
- L: Legal requirement
- O: Other evidence
- X: No evidence

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

- Improved use of appropriate diagnostic criteria
- Improved use of appropriate antibiotic therapy
- Improved use of appropriate imaging studies
- Avoidance of long-term medical problems
- Improved parental involvement in decision-making around the management of urinary tract infections
- Identification of the infants and children at most risk for long-term renal damage

## POTENTIAL HARMS

- Burden of imaging (e.g. discomfort of catheterization, radiation exposure) versus missed identification of treatable anatomic abnormalities.
- Use of amoxicillin for treatment of the acute urinary tract infection may be limited due to increasing resistance.

## CONTRAINDICATIONS

### CONTRAINDICATIONS

These guidelines are not intended for use in children:

- With known immunodeficiencies
- With known major genitourinary anomalies
- With sepsis with shock or meningitis
- Needing ventilator or other intensive care
- With other severe comorbid conditions

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

- The areas of uncertainty offering challenges in the management of urinary tract infection (UTI) include accurate and prompt diagnosis, decisions regarding prophylactic therapy, and decisions regarding imaging procedures.
- These recommendations result from review of literature and practices current at the time of their formulations. This protocol does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the guidelines to meet the specific and unique requirements of individual patients. Adherence to this guideline is voluntary. The physician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY



Appropriate companion documents have been developed to assist in the effective dissemination and implementation of the guideline.

## IMPLEMENTATION TOOLS

Clinical Algorithm  
Patient Resources  
Quick Reference Guides/Physician Guides

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of first time acute urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Apr 18. 20 p. [61 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1999 Mar 28 (revised 2005 Apr 18)

### GUIDELINE DEVELOPER(S)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

### SOURCE(S) OF FUNDING

Cincinnati Children's Hospital Medical Center

## GUIDELINE COMMITTEE

Acute Urinary Tract Infection Team

## COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Community Physicians: Emanuel Doyne, MD (Co-Chair); Shelly Voet, MD

CCHMC Physicians and Practitioners: Frederic Strife, MD, Nephrology (Co-Chair); William DeFoor, MD, Urology; Michael Gelfand, MD, Radiology; Elizabeth Jackson, MD, Nephrology/Urology; Steven Kraus, MD, Radiology; Laura Stadler, MD, Infectious Diseases

Patient Services: Nan Tobias, RN, Urology; Dawn Butler, PharmD, Pharmacy

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## FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

This guideline was developed without external funding. All Team Members and Clinical Effectiveness support staff listed have signed a conflict of interest declaration.

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence-based clinical practice guideline for patients 6 years of age or less with a first time acute urinary tract infection (UTI). Cincinnati (OH): Children's Hospital Medical Center (CHMC); 1999 Mar 28. 14 p.

## GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).

For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Children's Hospital Medical Center Health Policy and Clinical Effectiveness Department at [HPCEInfo@chmcc.org](mailto:HPCEInfo@chmcc.org).

## AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Urinary tract infection. Guideline highlights. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Apr. 1 p. Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).
- III-701. Urinary catheterization/bladder irrigation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center (CCHMC) Nursing Policies, Procedures and Standards. Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).

## PATIENT RESOURCES

The following Health Topics are available:

- Urinary system anatomy and function. Cincinnati Children's Hospital Medical Center, 2005. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Urinary tract infection (UTI) prevention. Cincinnati Children's Hospital Medical Center, 2005. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Temperature taking. Cincinnati Children's Hospital Medical Center, 2004. Electronic copies: Available in English and Spanish from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Vesicoureteral reflux (VUR). Cincinnati Children's Hospital Medical Center, 2004. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Urine culture: adult assisting a female child. Cincinnati Children's Hospital Medical Center, 2004. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Urine culture: adult assisting a male child. Cincinnati Children's Hospital Medical Center, 2004. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Kidney ultrasound (US). Cincinnati Children's Hospital Medical Center, 2003. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Voiding cystourethrogram (VCUG). Cincinnati Children's Hospital Medical Center, 2003. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Nuclear cystogram (RNC). Cincinnati Children's Hospital Medical Center, 2005. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).

- Renal cortical scan (DMSA). Cincinnati Children's Hospital Medical Center, 2005. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).

The following is also available:

- Urinary tract infections in young children. Guidelines for parents. American Academy of Pediatrics. Copies available for bulk purchase from the [American Academy of Pediatrics Web site](#).

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

## NGC STATUS

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